Notebook, N-04-08-24

04-08-24

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August 24, 1904.

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Results.

#3142 + 3143 ran practically the same as a good regular run. #3143 gained slightly on amp.-hrs. to 1V. the second time it was run this way.

#3201 gained 20 m-a-h. to 1V. but voltage was a little low all through.

Ord Silver Scales. 8/24/04.

Experiment #1.

Took regular little cells containing 2 7/8 + 1 7/8 and charged hot in water bath at 48° C. Set aside in room for ½ hr. after charge and then discharged regular.

[3]

Results.

*3183 dropped off 234 m-a-h. to 1V. and 107 to .50. Had a peculiar curve. First half of curve showed gain in voltage over reg.

Repeated experiment on *3184 and fully corroborated results.

8/26/04.

*2.

Took regular little cells as in *1 and charged regular in room. Set stand in water bath at 48°C for ½ hr. and then discharged at this temperature

8/26/04.

#3.

Took regular cells as before and both charged and discharged in water bath at 48°C.

Results.

#3183 + 3184 showed no gain in amp.-hrs. over best regular run but increased by about .03 in voltage.

Results.

*3142 + 3143 lost about 50 o/o to 1V. and 26 o/o to 50. Breaks in curve.

8/23/04.

*4.

Took regular little cells and charged in ice water at about 2.7° C. Set aband in room at usual temperature (about 24°C.) for ½ hr. and then discharged regular.

8/26/04.

#5.

Charged #3142 regular and #3143 in ice water at 2°C. Then took cells apart and cross-assembled and ran at regular temperature.

Results.

Cell with the 3e charged cold lost 2.5 o/o to 1V. and 6 o/o to 1.5o and had the usual cold break in the curve.

Cell with the 7is charged cold had a good normal curve and ran as many m-a-h. as the lowest regular run. It showed practically no bad effects.

Results.

Ran 850 to 1V., 903 to 50 with slight breaks in curve but otherwise fairly good.

Shows that H alone is needed to chg. the Ir. H probably takes no part in it.

Oct 5th.

#6.

Took a new 4.5 g. Ir and charged it in distilled H_2O. against a C.P. Zn strip, right across the line. Charged about 12 hrs. but the current varied a great deal and probably did not average as much as 100 m.a. Then assembled with 2 chgd. Zns and ran in 21 % KOH.

Results:

Ran 690 to 11., 803 to 50 Slight breaks.

It probably got fully charged but did not run good because NH_4 always limits the Fe.

"7.

Same as "6 except charged Fe in NH_4OH. Got full 200 volts.

4/19/06.

#8.

25-C., product from old Edmunicel cell treated as follows,-

1. Washed in hot H_2O 6 hrs.
2. Dried 10 hrs. moderate heat.
3. Soaked in hot conc. $CoSO_4$, $(NH_4)_2SO_4$ solution 4 hrs.
4. Connected up as cathode with Pt strip as anode and dipped in dist. H_2O and plated Co inside @ 1.4 amps for 10 min.
5. Washed in hot H_2O then KOH, then ran reg. in 21% KOH.

Results.

25-C. | 103 | 139 | 157 | 181 | 137 | 207 | See #10.

Results.

25-A. | 156 | 175 | 201 | 237 | 258 | 300 | 305 | 203 | 243

25-A. | 303 | 319 | 320 | 315 |

4/20/05.

#9.

Treated old product 25-A. as follows:-

1. Charged 15 hrs. @ 200.
2. Washed 6½ hrs. in hot H_2O.
3. Dried 2½ hrs.
4. Soaked in $CoSO_4.(NH_4)_2SO_4$ 13½ hrs.
5. Plated Co inside in new metals Co solution 2¼ hrs., starting current at 1 amp. and reducing to ½ amp. as cell heated up.
6. Soaked in hot H_2O 5 hrs. and in KOH ½ hr. then assembled and room reg. in 21 o/o.

Results.

N.B. - Pocket smelled great deal. Rose about 45 m-a-h.

4/25/[illegible]

#10.

Retreated 25-C. as follows;-

1. Washed free of KOH 8 hrs.
2. Dried 5 hrs.
3. Soaked in $CoCl_2$, NH_4Cl solution hot conc. $10\frac{1}{2}$ hrs.
4. Plated to anode @ 1 amp. hot for $\frac{3}{4}$ hrs. Weak sol. outside.
5. Washed in hot H_2O for 5 hrs. + KOH 1 hr. Assembled + rain req.

Results.

179-A.. 1st min 264 Soak neg. min before
2nd " 251 treatment - 430 to 11.
3rd " 243
Renewed & changed KOH.
4th " 297
5th " 282
6th " 280

4/26/06.

* 11.

Dissembled old cell * 179 and soaked
½ pockets in dist H_2O 10 hrs. till
free of KOH.
2. Dried 12 hrs.
3. Soaked 179-A in $CoCl_2$ 3½ hrs.
4. Dried ½ hr.
5. Soaked ½ hr. more in $CoCl_2$.
6. Dried ½ hr.
7. Soaked in dist ~1 o/o KOH 1½ hrs.
8. Changed KOH and chg'd and
ran neg.

Results.

179-B	1st run	395	Sat neg run before treatment run 430 to 11.
	2nd "	478	
	3rd "	451	
	4th "	458	
	5th "	458	

4/27/05.

#12.

Treatment of 179-B.

1. After drying 12 hrs. in #11, put in $CoSO_4.(NH_4)_2SO_4$ and soaked 24 hrs.
2. Plated Co inside at 1 amp for ½ hr. Used dist. H_2O with few drops of solution + Co anode. Blue hydrate of Co formed in solution. Very dense.
3. Soaked in hot H_2O 24 hrs.
4. Put in KOH and reversed against strip 1¾ hrs. @ 2.4 amps.
5. Put up with 2 chg'd Zes and run neg.

Results.

#13. 1st mm. 457 Very little tail.
2nd " 483
3rd " 487
4th " 487
Removed + changed KOH.
5th " 474
6th " 495

4/27/05.

#13.

Regular 3.2 gr. 7/0. mew.
1. Warmed w/o then dipped in $CoCl_2$ 10 mins.
2. Dried 10 mins.
3. Soaked 10 mins more in $CoCl_2$.
4. Dried 30 mins.
6. Soaked in light 7-10% KOH 6 hrs. then changed KOH and chg'd 4 mins reg.

Results.

*14.	1st min	305	No tail.
	2nd "	362	
	3rd "	380	
	4th "	380	
	5th "	380	

5/1/05.

*14.

Regular 3.2 g. 7/0, new.
1. Warmed up then soaked in $CoSO_4$ 3 hrs. hot.
2. Soaked in hot 21% KOH 40 mins.
3. Reversed against strip in 21%. 1 hour at 7.15 amps.
4. Assembled with 2 dry'd Tes tubes rinsed reg. in 21%.

5/1/05

Results.

#15. 1st mm 413 Hardly any bail.
2nd " 443
3rd " 448
4th " 445
5th " 445

#15.

Reg. 3.2 g. 7/c, new.
1. Warmed up then soaked in $CoSO_4$ 3 hrs. hot.
2. Soaked in hot 21 o/o KOH 1 3/3 hrs.
3. Assembled with 2 chg'd 3 es to mm reg. in 21 o/o.

5/1/05.

Results.

			Through KOH	
#16-a	115	126		132
b	88	104		111
c	85	92		97
d	114	111		114

#16.

Four new Pts - neg. 3.2 g.

Warmed up and then put them all in hot conc. $CoSO_4(NH_4)_2SO_4$. Soaked in this solution 4 hrs. then dried 1 hr. and repeated this treatment 4 times. Then soaked 6 hrs and plated as follows, using Co anode and few drops of solution in dist. H_2O

a - Plated ¼ hr. @ 2.1 amps.

b - " ½ " 1.14 "

c - " 1 " .5 "

d - Used fairly strong solution and plated 10 min. @ 2.5 amps.

Then washed all in hot dist. H_2O changing every few hrs. for 38 hrs.

Put up with Chgt 3 as in 21 o/o and rinn neg.

6/20/05.

Results.

1st run. - Started at 1.7 V. and ran 260 m-a-h. to 50 V., averaging 1 V.

2nd run. - A lot of lead plated out of solution on the Ni. I took it off and changed solution and continued charge. Discharge started at 1.6 V. and ran 46 m-a-h. to 50 V., averaging 1.09 V.

*17-A | 448 | 462 | 472 | 442 | 428 |

*17.

Put up strip of ordinary Pb against one neg. Ni pocket in 21% KOH. Ni on oxygen side.

Chg. neg. 15 hrs. @ 200. Run @ 100.

*17-A.

Put up Ni pocket from *17 with two Zn's in fresh KOH.

Results.

Would not run at all. Some lead plated out on the iron, but not very much.

"18 - A | 1313 | 1733 | 1773 | 1385 |

6/21/05

"18.

Put up strips of Pb as anode against one neg. Fe product in 7.1 % KOH.

"18 - A.

Put up Fe from "18 with 4 hrs in fresh KOH.

Results.

After 3 days, 24 cc. of gas had accumulated.

Collected from same kind of water in 3 days 2 cc of gas.

*19.

Took one reg. Je pocket and charged fully. Then put under water and collected gas.

Results.

	20-A			20-B
Run #1	1067 to W.	1487 to 50		1133 - 1607
2	1100	1780		1140 - 1897
3	1245	2012		1298 - 2087
4	1083	1767		1250 - 2058
5	1133	1833	500 mile	1192 - 1967
6	1158	1875		1167 - 1908
7	1375	2088		1375 - 1587
8	1400	1955		1311 - 1561
	Clayed fully + S.C. 4 hrs. —			
9	1455	2027		1462 - 1600
	Clayed fully + S.C. 6 hrs. —			
10	1532	2093		1510 - 1667
11	1273	1923		1248 - 1573
12	1327	1927		1307 - 1577
13	1300	1927		1233 - 1577
14	1308	1900		1215 - 1545
15	1350	1967		1257 - 1593
16	1297	1933		1179 - 1567
17	1317	1910		1173 - 1550
18	1300	1867		1133 - 1547
19	1333	1867		1173 - 1533

#20

Put up two cells of reg. 3 e mix 4 g cakes against four 3.5 g. 7/16, to get curve of reg. mix and also to see effect of short cementing.

Run through regular test first.

Results.

	1	2	3	4	5	6
21 A	485	492	510	488	485	493
B	488	480	485	462	458	465

Fully chg'd A and put both on test standing test at 4.00 P.M., July 29, 1905.

9-7-05. Cells have stood 6 weeks. Took them off of test test and allowed them to cool. Then discharged A at 100 without further charge. It ran 29 m-a-h. to 1V. and 28 to .50 V.

Then chg'd + ran both cells regular several times as follows,-

	7	8	9	10	11	Charged 100	12	13
21 A	502	490	491	475	477		494	491
B	344	425	434	438	434		434	446

The cells have depreciated much more than the results to 1V. show. The heat in some way has created resistance in the pockets so that they break from 1.28 to about 1.15 V. sometime before breaking past 1V. This is more marked in B than A. It has badly showed in A on the first run but developed in the second and grew worse and worse each time B went just the opposite way.

7/11/05.

#21

Put up two reg 7½ mx cells, 3.2 grams against two 4.5 gram Jes, 21 o/o KOH in metal cans. Give them a few runs on the board and then charge one fully and let the other be discharged and put them in the Hot Test in this condition. Do not connect them up to charge and discharge but just let them stand in the heat for about a month and then run on the board again.

It was bad on the first run and improved somewhat with running but never came up very far. It's best curve broke after running only 3 hrs. nominally.

This resistance shows also in the tail which starts at 1.48 to 1.50 V. instead of 1.0 to 1.3 V.

Results.	1	2	3	4	5	6
22 A	469	479	493	463	467	475
B	497	488	502	480	477	485

Fully chg'd A and put both on cold standing test at 4.00 P.M., July 28.

9-7-05. Discharg'd A after standing chg'd 6 weeks. It ran 3.26 to 1V. and 3.92 to .50, voltage averaging about 1.20 = 30 o/o loss on watt-hrs. to .88 V.

Then chg'd and ran both cells regular several times as follows,—

	7	8	9	10	11	Rest 24 hours	12	13
22 A	490	493	472	472	467		474	479
B	471	485	478	480	473		480	485

Cause is more concealed at the bend, showing resistance has increased slightly, but is practically as good as before.

7/11/05.

#22

Put up two cells exactly the same as in #21 and treat them just the same except let them stand the same length of time cold.

Results.

	23 A		23 B	
Center cal dry -	93		92	
After 1 hr. soak	98	5	96	4
" 6 hrs. "	98	0	96	0.
" 1st charge	100	2	99.5	3.5
" ½ hr. stand	98	-2	98	-1.5
" 1st discharg	100	2	100	2
" 3 days stand	100	0	99	-1
" 2nd charge	100.5	.5	101	2
" ½ hr. stand	100	-.5	99	-2
" 2nd discharg	101.5	1.5	100.5	1.5
" 3rd charge	100	-1.5	99	-1.5
" ½ hr. stand	99.5	-.5	99	0
" 3rd discharg	101	1.5	100	1
" 4th charge	99.5	-1.5	99	-1
" ½ hr. stand	99.5	0	99.5	.5
" 4th discharg	101.5	2	101	1.5

This shows that on the first two charges the mils that were gained disappeared in each case after cells had stood 15 minutes. and on the second two charges mils were actually lost.

Mils were gained however on discharge in each case and on the four discharges 23 A gained 7

9/8/05

#23

Put up two cells neg 3.2 g/c against 2.3 as in 21 % KOH to note swell of ¾. Marks point in the center of the pocket and take all calipers at this point. Take caliper dry and after soaking in KOH a few hrs. Then during both charge & discharge take caliper readings at frequent intervals.

Charge Rate 200 M-A.
Discharge " 100 "

and 23 B 6. It is seen also that a large proportion of the swell came from soaking before the first charge – 23 A gained 5 and 23 B 4 – and this of course was a permanent gain as it never dropped below this caliper after soaking.

The total gain in four runs was for A, 8.5 and B, 9.

[4+]

Results.

Center col. dry – 24 A	92		24 B	93	
After 1 hr. soak	96	4		96	3
" 6 hrs. "	96	0		96	0
" 1st charge	109.5	13.5		121.5	25.5
" ½ hr. stand	119	-.5		121	-.5
" 1st discha.	120	1		120.5	-.5
" 3 days stand	118	-2		118.5	-2
" 2nd charge	128	10		129	10.5
" ½ hr. stand	127	-1		129	0
" 2nd discha.	130	3		130.5	1.5
" 3rd charge	128.5	-1.5		129.5	-1
Changed KOH to 21 o/o.					
" ½ hr stand	128	-.5		128	-1.5
" 3rd discha.	131	3		131	3
" 4th charge	127	-4		128	-3
" ½ hr. stand	127	0		128	0
" 4th discha.	130.5	3.5		130.5	2.5

After cells had smelled they ran practically the same as in 21 o/o as they did in 33 o/o. The amp-hrs to 1V. did not get very high from the 33 o/o. but curve had a long tail. Amp.-hrs. came down after 1st chg in 21 o/o, but smell would not come down at all.

*24.

Same as *23 but in 33 o/o KOH.

In these runs the total gains on charge, subtracting that lost by standing, was, for 24 A, 30 and for 24 B, 33.

Gain on discharge 24 A, 7 and 24 B, 4.
Gain on 1st soak " 4 " " 3.
Total gain " 39 " " 38.

The gains on discharge was about the same as in 21 o/o (See *23) but they had the additional large smell on charge which is hard to account for unless it may come from trapped gas.

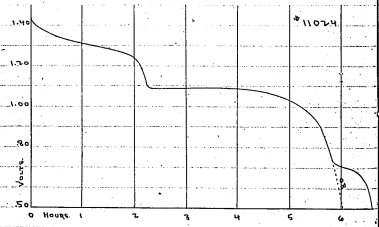
After the big smell has been attained they act same as 21 o/o — all loss in cal. on 3rd chg. + gain on discha.

9/13/05.

Results.

4 g. cake of this with regular pressure or less was best. Took long time in forming before KOH came free of S. Short-circuiting after a full charge improved its running.

Best run was 1044 to 1V. - 1350 to .50 but there was always a big break in curve after about 2 hrs running as shown below.



*225

Made mix to get curves for German patent case as follows,-

32 g. 3 & S, 3 cycle - through 200 mesh
8 g. Graphite

Mixed well dry and then moistened with 33 % KOH and rolled 20 min.

Pockets will be charged & reversed and KOH changed after each run- til it tests fairly free of S. Then run.

Pockets swelled great deal. Some of them split.

5 g. cake of plain 3 & S, through 200 mesh runs about 380 to 1V. - 440 to .50 V. after being formed in same way.

Results.

Not as good as 8 + 2.

9/15/05.

#26.

Same as #25 except made 7+3 mix.

Results.

Cells stood for two weeks after making up before running.

Caliper of 7/16 after 2 weeks soak in 33 o/o was —

	27 A	27 B	
	97-101	97.5-98.5	
Hot	95	95	After 1st charge
"	95	95	" " discharg
"	95	96	" 2nd charge
"	95	96	" " discharg
"	96	97	" 3rd charge
"	98	98	" " discharg
"	98	98	" 5th charge
"	98	98	" " discharg
"	99	98	" 6th charge
Cold	101	106	" " discharg
"	113	112	" 7th charge
"	113	111	" " discharg
"	116	111	" 8th charge
"	118	111	" " discharg
"	122	114	" 10th charge
"	125	115	" " discharg

9/19/05.

*27

Put up two cells in metal cans of one neg. 3.2 g. Zn against 27 as in 33 o/o KOH, to see if Zn smells as much in hot 33 o/o as in cold. According to the gas smell theory it should not.

Caliper at marked point.

Results.
About the same as #25.
B was slightly better than A.

9/19/05

#29

A. - Mixed 20 g 325 (thru 200 mesh) with 5 g. foliated graphite. Rolled dry and mixed well together. Weighed out two pockets 3.7 g

B. - Took mix that was left after weighing out two pockets dry and moistened it with 33 % KOH and rolled about ten minutes longer. Made two 4 g pockets.

Results

	29 A	29 B
Run 1	1767 - 1860	1700 - 1860
2	1700 - 1907	1700 - 1880
3	1767 - 2013	1767 - 2020
	Chg'd fully and allowed to self-heat in air 2 hrs - i.e. they had heated and cooled off in 1 hr but let stand 1 hr. more after cooling.	
	E.M.F. with chg'd pos when reassembled was .A .50 .. B .70. Put on shedg @ 2.00 and P.D. of both was .40 at first but reached 0 in few minutes.	
4	1333 - 2093	1780 - 2010
5	1310 - 2047	1317 - 2015
6	1390 - 2067	1333 - 2050
	Chg'd fully and allowed to self-heat in air 3 hrs.	
7	1383 - 2103	1333 - 2030
8	1331 - 2093	1305 - 1991

Seems to have some beneficial effect that short-circuiting has.

10/13/05.

#29.

Determine if self-heating after a full chg affects the running of our regular 3 e mix.

Put up two cells of one 4 g 3 e against six chg'd. pos. Give them two or three regular runs and then charge up full and re-solder them. Take out of XOH and let stand in air until they heat up and cool off again. Then put backs in cells, charge & run as before.

10/13/05.

#30

#71 A shows that Ni cannot hold its charge when heated to about 55°C. for a long time.

Determine how quickly loss of charge takes place at this temperature by making up four neg. Ni cells, 3.2 g. in metal cans and after running several times, charge fully and let stand in Hot Test for different lengths of time before discharging.

Results.

30 A	483	497	491	497	Boat cell.
B	498	523	517	497	
C	497	523	507	495	
D	499	520	510	500	

30 A Fully charged + put in Hot Test for 1 hr. Discharged neg.
B " " " " 3 hrs. " "
C " " " " 5 " " "
D " " " " 24 " " "

30 A	452	483	487 - 452 = 35 lost
B	487	498	497 - 487 = 10 "
C	481	500	495 - 481 = 14 "
D	460	527	500 - 460 = 40 "

Results.

	31 A	31 B
Run 1	522 - 633	522 - 640
3	517 - 630	515 - 630
	Fully charged and tools Ni out. Set aboard in air 2 hours then dis.	
4	497 - 578	495 - 581
	Fully charged and tools Ni out Set aboard in air 4 hrs.	
5	485 - 567	497 - 567
	Fully charged and tools Ni out Set aboard in air 20 hrs.	
6	337 - 525	420 - 522
7	457 - 567	473 - 577
8	448 - 553	477 - 595
9	465 - 558	483 - 617
10	450 - 567	477 - 603

Run 6 was a peculiarly bad curve. A.V.P.D. was about 1.17.

This treatment seemed to do the Ni permanent injury, as it never regained either its full capacity or voltage. Resistance was introduced in some way.

10/13/05.

#31

To determine if Ni loses its charge in air.

Make up two regular Ni cells 3.2 g. and after running several times regular, charge fully, take out of KOH and let Ni pockets stand in air for different lengths of time before putting back in cell and discharging.

Results.

	32 A	32 B
Caliper after discharge #8	98	98
	Put in 33 o/o	
Charge #9	115	111
Discharge 9	117	114
Charge 10	118	120
Discharge 10	122	124
Charge 11	122	125
Discharge 11	126	127
Charge 12	—	130
Discharge 12	130	136
Standing	130.5	133

Soaked 3½ days in warm H_2O till phenolphtalein showed absolutely no trace of alkalai.

Caliper then was 129 129

10/18/06.

#32.

Take two regular 3.7 g ½ cells which have been running, and caliper. Then put in 33 o/o KOH and charge + discharge regular, caliper ing ½ after each, for several runs. When the swell has reached maximum take ½ out after discharge and soake in warm H_2O until free of KOH. Caliper again.

If the swell is due to gas this treatment should bring it down.

Results.

	33 A	33 B
Runs 8	508 - 617	482 - 583
9	490 - 563	480 - 553
	Washed, chg'd 7/16 in H20 2 days till free of KOH. Then assem. & dis. reg.	
10	447 - 557	417 - 520
11	497 - 603	450 - 553
12	492 - 615	481 - 567
13	482 - 608	478 - 567
	Washed, chg'd 7/16 free of KOH and let stand in air 24 hrs. Dis.	
14	310 - 373	273 - 367
15	457 - 587	413 - 477
16	470 - 595	423 - 509

10/19/05.

#33.

Take two regular 3.2 g 7/16 cells and after giving three or four regular runs, charge regular then take 7/16 out of cell and wash for several hours in cold water, changing it frequently, until it tests free of KOH. Then assemble pockets back in cell in reg. KOH and discharge regular without further charge.

Results.

	34 A	34 B
Cal. after		
½ of Chg #1	94	97
Charge #1	101	100
Discharge #1	99	101
C — 2	102	101
D — 2	102	102
C — 3	104	103
D — 3	104	103
C — 4	104.5	103
D — 4	105	104
C — 5	105.5	104.5
D — 5	107	105
C — 6	106.5	105
D — 6	107	105
C — 7	107	105.5
D — 7	109	106
C — 8	109.5	106
D — 8	110	106.5

Ow. cap. was 34 A 330 to 1V, 490 to 50
34 B 320 " , 480 "

10/20/05.

#34.

#34 on the first charge showed that for the first 3 hrs. the swell in 33 o/o was no more than in 21 o/o.

Make up two new reg. 3.7 g 7/8 cells and run them in 33 o/o charging only 3 hrs. each time and calipering in center after each charge + discharge.

This is to see if swell will keep down on short charges.

10/20/05.

#35.

Make up two new regular 3.2g 7½ cells and run them just the same as in #34 except in 21 o/o.

For comparison with #34.

Results.

	35 A	35 B
Cal. after ½ of Chg. #1.	95	92
Charge #1	96	91
Discharge #1.	98	93
C – 2	98	93
D – 2	99	95
C – 3	100	95
D – 3	99	95
C – 4	98	94
D – 4	100	96
C – 5	99	95
D – 5	101	96
C – 6	99.5	95.5
D – 6	100	96.5
C – 7	99.5	97
D – 7	101	97
C – 8	99	96
D – 8	100.5	97.5

Av. calp. was 35 A 388 to 1V., 490 to 500
35 B 380 " " 475 "

10/20/05.

#36.

Take two regular 3.2 g/h cells which have had several runs in 21 o/o and charge 15 hrs. @ 200. Then fill with 33 o/o and after letting them stand 15 minutes discharge @ 100 to .50 V. Caliper after charge and discharge.

Repeat this several times, charging in 21 o/o and discharging in 33 and note swell.

Results

	37 A	37 B
Dry cal.	89	91

Cells stood a little over a year after making up before the solution was put in and the following test made —

37 A	37 B	
89	89	Dry caliper
90	91	After soaking 3 hrs.
91	93	After 1st charge
91	94	" " reverse
92	94	" 2nd charge
93	94	" " reverse
93	95.5	" 3rd charge
94	96	" " reverse
96	98	" 4th charge
95	98	" " reverse
94	97	" 5th charge
95	97.5	" " reverse

Total gain 37 A = 6
" " 37 B = 8.5

10/20/05.

#37.

Make up two pockets of graphite to caliper about .090". Assemble each one with two empty guds in 33 % KOH.

Charge with graphite as anode for 15 hrs. @ 700 then reverse for same length of time @ 700. Take center caliper every 3 hrs. Repeat several times.

Pockets were made at Silver Sales. 3.5 g cake, S.P. 650, Con. 500.

10/20/05

Results.

#38.

Same as #37 except use 7 10% KOH

	38 A	38 B	
Dry cal.	93	91	

Cells stood a little over a year after making up before the solution was put in and the following test made —

38 A	38 B	
92	91	Dry caliper
93	90	After soaking 3 hrs.
93	92	After 1st charge
93	91	" " reverse
95	92	" 2nd charge
94.5	93	" " reverse
94	91	" 3rd charge
95	94	" " reverse
96	96	" 4th charge
95	93	" " reverse
95	94	" 5th charge
96	94	" " reverse

Total gain 38 A = 4

" " 38 B = 3

Rennets.

	1	2	3	4	5	6	
39 A	149	220	148	158	162	143	av. 229 to .50
B	245	224	163	167	165	133	" 220 "

Assembled each c/o Ja nitre 4 ½ ins.

	7	8	9	10	11	
39 A	138	141	153	155	145	av. 172 to .50
B	140	173	152	152	145	" 169 "

10/23/05.

*39

Make up two pockets each containing 2.5 g. req. ½ mix and 1 g. req. Ja mix well mixed together.

Assemble as ½ ins with two charged Jas each, in 71.9.0 KOH.

Charge 15 hrs. @ .200. Discharge @ 100.

Results.

	1	2	3	4	5	6	
40 A	247	247	217	227	247	233	av. 230 to.50
B	270	268	210	228	238	225	" 280 "

Assembled each as 7½ with 2 3 ea.

	7	8	9	10	11	
40 A	62	61	33	32	37	av. 72.10.50
B	32	36	32	32	32	" 63 "

10/23/05.

#40

Two sprockets just the same as #39 but assemble as 3 ea with four charged 7½ each. in 7 1/0 KOH.
Charge 15 hrs. @ 200. Discharge @. 100.

Results.

41 7.42 A-H to 30V, 7.44 to 0.
E.M.F. 1.09, Av. P.D. .55

42 5.17 A-H to 30V, 5.19 to 0.
E.M.F. 1.09, Av. P.D. .54

43 8.95 A-H to 30V, 9.39 to 0.
E.M.F. 1.00, Av. P.D. .56

44 8.35 A-H to 30V, 8.39 to 0.
E.M.F. 1.00, Av. P.D. .56

45 4.91 A-H to 30V, 5.02 to 0.
E.M.F. 1.00, Av. P.D. .55

46 4.40 A-H to 30V, 4.45 to 0.
E.M.F. .99, Av. P.D. .53

11/4/05.

Experiments on Edison Primary Cell.

Use small Type B cells which are rated at 15 ampere-hours.
Use 200 cc. 21.9% KOH in glass tumblers, and add the following:-
Discharge @ 500 m-a to 0 V.

* 41 20 g. Ammonium Chloride

42 20 g. Ammonium Sulphate
Would not all dissolve.

43 20 g. Potassium Chlorate
Would not all dissolve.

44 20 g. K. Oxalate
Would not all dissolve.

45 18 g. K. Binoxalate.

46 20 g. K. Arsenate

[81]

Results.

47 Ppt scaled off
11.33 A-H to .30 V, 11.40 to 0. E.M.F. .85, Av.P.D. .51

48 Blue ppt. from Cu.
7.20 A-H to .30 V, 7.27 to 0. E.M.F. .98, Av.P.D. .53

49 Blue ppt. then yellow. Ppt scaled off in big pieces.
3.73 A-H to .30 V, 3.76 to 0. E.M.F. .96, Av.P.D. .58

50 Blue ppt. from Cu.
6.15 A-H to .30 V, 6.26 to 0. E.M.F. .97, Av.P.D. .56

51 Heavy brown oily ppt.
14.33 A-H to .30 V, 14.69 to 0. E.M.F. .93, Av.P.D. .50

52 9.00 A-H to .30 V, 9.17 to 0.
E.M.F. .95, Av. P.D. .56

53 Yellow ppt.
10.87 A-H to .30 V, 11.14 to 0.
E.M.F. .95, Av.P.D. .54

54 1.01 A-H to .30 V, 1.02 to 0.
E.M.F. 1.26, Av. P.D. .46

55 9.70 A-H to .30 V, 9.94 to 0.
E.M.F. .94, Av.P.D. .54

47 20g Arsenite K

48 20 g K Citrate

49 20g K Nitrate

50 20g Na Tartrate

51 20g Na Hyposulphite

52 20g K Persulphate
Would not all dissolve.

53 20 g. K Sulphite
Would not all dissolve.

54 20g K Manganate
Would not all dissolve. Dark green.

55 20g K Hypophosphite

Results.

56 9.65 A-H to 30 V, 10.01 to 0.
E.M.F. .95, Av. P.D. .53

57 Solution lost its color on discharge.
Yellow scale formed on Zn.
2.87 A-H to 30 V, 3.00 to 0. E.M.F. .005, Av. P.D. .43

58 Sol. lost color on discharge.
10.01 A-H to 30 V, 10.16 to 0. E.M.F. .97, Av. P.D. .55

59 Yellow scale formed on Zn.
E.M.F. .94 Res. to −.47 on 2 min. Kept fluctuating between
−.22 and −2.40 S shaking caused it to approach 0.

60 6.50 A-H to 30 V, 6.66 to 0
E.M.F. .96, Av. P.D. .54

61 6.42 A-H to 30 V, 6.58 to 0.
E.M.F. .96, Av. P.D. .54

62 9.60 A-H to 30 V, 9.67 to 0.
E.M.F. .955, Av. P.D. .55

63 9.58 A-H to 30 V, 9.72 to 0.
E.M.F. .95, Av. P.D. .56

64 14.25 A-H to 30 V, 14.87 to 0.
E.M.F. .96, Av. P.D. .42

56 20 g. Pyrophosphate Na.

57 20 g. K Cyanide. Yellow sol.

58 20 g. K Ferrocyanide. Yellow sol.
Would not all dissolve.

59 20 g. K Ferricyanide. Red-yellow
Would not all dissolve.

60 20 g. K Sulphocyanide

61 20 g. Sugar

62 Regular.
New copper supports oxidized.

63 Regular.
Copper supports cleaned by HNO_3

64 Regular but in 200 cc 20% $NaOH$ instead of 21% KOH.

Results

65	11.42 A-H to 30V, 11.55 to 0. E.M.F. 1.04, Av. P.D. .55	65	10 g. NH_4OH
66		66	10 g. Ammonium Bromide
67	Brown coating on Fe & powder on bottom of tumbler. 1.26 A-H to 30V, 1.78 to 0. E.M.F. 1.02, Av. P.D. .51	67	20 g. Ammonium Carbonate
68	Black scale on Fe 2.25 A-H to 30V, 2.76 to 0. E.M.F. 1.06, Av. P.D. .56	68	20 g. Ammonium Nitrate
69	Black scale on Fe 6.90 A-H to 30V, 6.97 to 0. E.M.F. 1.00, Av. P.D. .56	69	2 g. Ammonium Vanadate
70	8.75 A-H to 30V, 8.88 to 0. E.M.F. .96, Av. P.D. .53	70	20 g. Chloride Na
71	10.40 A-H to 30V, 10.53 to 0. E.M.F. .96, Av. P.D. .55	71	5 g. Iodide K
72	10.78 A-H to 30V, 10.98 to 0. E.M.F. .96, Av. P.D. .54	72	10 g. Bromide K
73	Solution red-pink brown when dissolved. On diseleg changed to bright yellow. After dis. - pearl gray. 11.79 A-H to 30V, 12.03 to 0. E.M.F. .96 Av. P.D. .45	73	5 g. Sulphide K

Results.

74 10.71 A-H to 30V, 10.96 to 0.
E.M.F. .96 Av. P.D. .53

75 10.71 A-H to 30V, 10.83 to 0.
E.M.F. .96 Av. P.D. .53

76 Black scale on Zn.
9.50 A-H to 30V, 9.57 to 0.
E.M.F. .94 Av. P.D. .55

77 Yellow sol. changed to greenish on discharg.
E.M.F. .33 Down to 0 in 1 minute

78 Yellow sol. changed to greenish on discharg.
E.M.F .78 Down to 0 in 9 mins.

79 6.95 A-H to 30V, 7.04 to 0.
E.M.F. .95 Av. P.D. .55

80 White ppn. on bottom after discharg.
17.75 A-H to 30V, 19.02 to 0.
E.M.F. .96 Av. P.D. .50

81 10.71 A-H to 30V, 11.00 to 0.
E.M.F. .935 Av. P.D. .54

74 20 g. Fluoride Na
Would not all dissolve

75 20 g. Tungstate Na

76 20 g. Molybdate Na

77 20 g. Chromate K

78 20 g. Bichromate K

79 20 g. Orthophosphate K

80 10 g. Silicate Na

81 10 g. Stannate Na
Would not all dissolve.

82 10 g. Sulphoarsenate Na

Results.

83 Orange red. sol. Square flat orange colored crystals on electrode + glass after discharg.
5.01 A-H to 30 V, 5.06 to 0. E.M.F. 1.00 Av. P.D. .54

84 Yellow turbid sol.
9.42 A-H to 30 V, 9.52 to 0.
E.M.F. .94 Av. P.D. .55

85 Cu passed when first on discharg.
8.76 A-H to 30 V, 8.88 to 0.
E.M.F. .90 Av. P.D. .56

86 8.42 A-H to 30 V, 8.55 to 0.
E.M.F. .95 Av. P.D. .53

87 .15 A-H to 30 V, .16 to 0.
E.M.F. .91 ; Av. P.D. .64

88 11.27 A-H to 30 V, 11.65 to 0.
E.M.F. .96 Av. P.D. .54

89 Decomposed ?
7.75 A-H to 30 V, 7.97 to 0.
E.M.F. .95 Av. P.D. .54

90 5.23 A-H to 30 V, 5.32 to 0.
E.M.F. .95 Av. P.D. .52

91 7.85 A-H to 30 V, 8.00 to 0.
E.M.F. .95 Av. P.D. .55

83 10 g. Nitroprusside Na

84 10 g. Aldehyde

85 5 g. Formaldehyde

86 10 g. Formic acid

87 10 g. Trichloroacetic acid

88 10 g. Acetone

89 10 g. Manganous Sulphate
Would not all dissolve.

90 5 g. Aluminum

91 10 g. Glycerine

Results.

92	10.00 A-H to 30V, 10.16 to 0. E.M.F. .95 Av.P.D. .55	92 10 g. Ethyl Alcohol.
93	8.00 A-H to 30V. 8.15 to 0. E.M.F. .95 Av.P.D. .54	93 10 g. Methyl Alcohol
94	5.32 A-H to 30V, 5.46 to 0. E.M.F. .95 Av.P.D. .54	94 20 g. Borax
95	Specimen sol. during dissolving. After dissolving and stand, dense yellow sol. 14.19 A-H to 30V, 14.29 to 0. E.M.F. .95, Av.P.D. .53	95 10 g. Sulphur Would not all dissolve.
96	21.00 A-H to 30V, 24.14 to 0 E.M.F. .96 Av.P.D. .51.	96 200 cc. 33 g% KOH solution.
97	E.M.F. .92, Av.P.D. .50 A-H to 0V. 1.125	97 200 cc. 10 g% KOH + 20 g Na Hyposulphite
98	E.M.F. .88 Av.P.D. .48 A-H to 0V. 1.09	98 Same + 30 g. Na Hyposulphite
99	E.M.F. .88 Av.P.D. .48 A-H to 0V. .858	99 Same + 40 g. Na. Hyposulphite
100	E.M.F. .86 Rec. in one minute	100 200 cc. 5 g% KOH + 30 g Na Hyposulphite

Results

101 E.M.F. .86 Ran in one minute

102 E.M.F. .48 Ran 3½ min. to 0 V.

103 16.34 A-H to 30 V, 17.26 to 0.
E.M.F. .96, Av.P.D. .48

104 15.56 A-H to 30 V, 18.36 to 0.
E.M.F. .96, Av.P.D. .44

105 18.67 A-H to 30 V, 19.11 to 0
E.M.F. .96, Av.P.D. .53

106 Brown ppt. Looks like coffee.
17.00 A-H to 30 V, 17.86 to 0.
E.M.F. .96, Av.P.D. .46

107 After dis. lower part of sol. was heavy like gluecose and of a light brown color.
14.00 A-H to 30 V, 19.86 to 0. E.M.F. .98, Av.P.D. .38

108 Sol. was clear orange colored on top and turbid greenish-yellow below. Changed to dense yellow all through
10.16 A-H to 30 V, 10.18 to 0. E.M.F. .96, Av.P.D. .49

109 E.M.F. .48
Would not run at all. Drop of about 3.5 volts between electrodes at 500 m.a.

101 200 cc 5% KOH + 40 g Na Hyposulphite

102 200 cc H_2O + 50 g Na Hyposulphite

103 200 cc 20% NaOH

104 200 cc 20% NaOH

105 200 cc 28 % KOH

106 200 cc 20% NaOH + 20 g Na Hyposulphite

107 Same NaOH + 10 g Na Silicate

108 Same NaOH + 10 g Sulphur

109 200 cc H_2O + 30 g Na Silicate

Results.

110 White powder on bottom after drying.
— 17.39 A-H to .30 V, 18.70 to 0.
E.M.F. .96 Av. P.D. .50

111 Bluish-black ppt. on dis. Cu blackened.
6.17 A-H to .30 V, 6.37 to 0
E.M.F. 1.12 . Av. P.D. .49

112 Bluish-black ppt. Cu blackened.
12.50 A-H to .30 V. 14.39 to 0.
E.M.F. .98 . Av. P.D. .45

113 Slight brown ppt.
16.50 A-H to .30 V, 17.95 to 0.
E.M.F. .97 Av. P.D. .47

114 Slight brown ppt.
17.14 A-H to .30 V, 19.13 to 0.
E.M.F. .97 Av. P.D. .47.

115 On dis. sol. clear green on top, yellow turbid on bottom.
15.75 A-H to .30 V, 19.97 to 0. E.M.F. .965, Av. P.D. .42

116 15.50 A-H to .30 V, 19.22 to 0.
E.M.F. .965 Av. P.D. .44
2 Holes eaten right through Cu.

117 Brown ppt.
15.00 A-H to .30 V, 17.02 to 0.
E.M.F. .965 Av. P.D. .45

118 14.89 A-H to .30 V, 18.38 to 0.
E.M.F. .965 Av. P.D. .47

110 10 g. Na_2Si. Duplicate of 80.

111 20 g. Sulphocyanide of Ammonia.

112 200 cc. 20 % $NaOH$ + 10 g. Sulphocyanide of Ammonia

113 Same $NaOH$ + 10 g. $Na_2S_2O_3$

114 Same $NaOH$ + 5 g. $Na_2S_2O_3$

115 Same $NaOH$ + 2 g. Sulphur

116 Same $NaOH$ + 5 g. KOH.

117 Same $NaOH$ + 2 g. $Na_2S_2O_3$

118 Same $NaOH$ + 5 g. Na_2Si

119	Brown ppt. 16.00 A-H to .30V, 18.64 to 0. E.M.F. .965 Av.P.D. .44	119 Same $NaOH$ + 5g $Na_2Silicate$ + 2g Hyposulphite
120	11.15 A-H to .30V, 11.78 to 0. E.M.F. .96 Av.P.D. .51	120 200 cc. 15 o/o $NaOH$.
121	15.58 A-H to .30V, 17.78 to 0. E.M.F. .96 Av.P.D. .45	121 Same + 10 g $Na_2Silicate$ Would not all dissolve.
122	8.79 A-H to .30V, 8.85 to 0 E.M.F. .95 Av.P.D. .57	122 200 cc. 21 o/o KOH.
123	18.25 A-H to .30V, 19.61 to 0 E.M.F. .97 Av.P.D. .49	123 Same + 20 g $Na_2Silicate$ Would not all dissolve
124	15.58 A-H to .30V, 16.73 to 0 E.M.F. .96 Av.P.D. .51	124 Same + 5 g. $Na_2Silicate$ Would not all dissolve
125	Brown ppt. then white on top of it 16.09 A-H to .30V, 17.35 to 0 E.M.F. 95.5 Av.P.D. .51	125 Same + 10 g $Na_2Silicate$ + 5 g. Hyposulphite Would not all dissolve
126	15.25 A-H to .30V, 18.21 to 0. E.M.F. .96 Av.P.D. .47	126 200 cc. 20 o/o $NaOH$ + 1 g Sulphur Would not all dissolve
127	6.91 A-H to .30V, 7.98 to 0 E.M.F. .96 Av.P.D. .42	127 200 cc. SiO_2H solution 10 o/o Would not all dissolve = probably 6 to 8 o/o

to #148

Note – From here on, used commercial water glass (semi-liquid) instead of crystals of Na Silicate. Amount stated was dissolved in 200 cc of electrolyte and then 200 cc of the double solution was used in cell.

128	E.M.F. 1.04	0 in 2 minutes.	128 10 o/o NaOH + 20 g Na Silicate
129	E.M.F. 1.17	Would not run	129 Same + 50 g Na Silicate Flocculent
130	4.86 A-H to 30V.	20.18 to 0	130 20 o/o NaOH + 20 g Na Silicate
	E.M.F. .96	Av.P.D. .45	
131	10.82 A-H to 30V.	12.70 to 0	131 Same + 50 g Na Silicate
	E.M.F. .965	Av.P.D. .48	
132	E.M.F. 1.18	Would not run.	132 10 o/o KOH + 20 g Na Silicate
133	E.M.F. 1.16	Would not run	133 Same + 50 g Na Silicate Flocculent

12/15/05

134 19.60 A-H to 30V. 21.64 to 0.
E.M.F. .97 Av.P.D. .48

135 9.13 A-H to 30V. 9.24 to 0.
E.M.F. .98 Av.P.D. .51

136 E.M.F. .71 (?) Would not run.

137 16.50 to 30V, 17.58 to 0
E.M.F. .98 Av.P.D. .49

138 16.53 to 30 V, 18.12 to 0
E.M.F. .96 Av.P.D. .44
Peculiar curve.

139 21.50 to 30 V, 22.98 to 0.
E.M.F. .965 Av.P.D. .49

140 16.46 to 30 V, 16.87 to 0.
E.M.F. .98 Av.P.D. .52

141 17.75 to 30 V, 19.33 to 0.
E.M.F. .99 Av.P.D. .50

142 18.83 to 30 V 20.56 to 0.
E.M.F. .995 Av.P.D. .48

134 21 % KOH + 20 g Na Silicate

135 Same + 50 g Na Silicate

136 5 % NaOH super-saturated with Na Silicate by heating (150 g?).

137 200 cc 20 % NaOH req.

138 Same + 15 g K Silicate wet

139 21 % KOH + 15 g K Silicate wet

140 Same KOH + 5 g Na Silicate

141 Same KOH + 10 g Na Silicate

142 Same KOH + 15 g Na Silicate

12/15/05.

143	20.66 to .30 V, E.M.F. 1.10	22.32 to 0. Av.P.D. .47	143 Same KOH + 20 g Na Silicate
144	18.50 to .30 V, E.M.F. .96	20.29 to 0 Av.P.D. .46	144 20 o/o NaOH + 5 g Na Silicate
145	17.75 to .30 V, E.M.F. .945	20.21 to 0 Av.P.D. .44	145 Same NaOH + 10 g Na Silicate
146	17.49 to .30 V, E.M.F. .945	20.54 to 0 Av.P.D. .43	146 Same NaOH + 15 g Na Silicate Slight weight CuO
147	29.31 to .30 V, E.M.F. .995	30.00 to .08 V. Av.P.D. .51	147 21 o/o KOH in excess - 800 cc.
148	15.87 to .30 V, E.M.F. .96	16.91 to 0 Av.P.D .51	148 21 o/o KOH + 5 g K Silicate dry - Yellow.
149	15.91 to .30 V, E.M.F. .995	18.85 to 0 Av. P.D. .45	149 20 o/o NaOH + 2 g K Silicate dry.
150	16.93 to .30 V, E.M.F. .99	19.50 to 0. Av.P.D. .45	150 Same NaOH + 5 g K Silicate dry.
151	9.60 to .30 V, E.M.F. 1.955	9.64 to 0 Av.P.D. .54	151 Cu peroxidized by current 14 hrs @ .700 amps. Assembled with regular zinc in 700 cc. 21 o/o KOH. Yellow CuO

152	13.50 to 30V, E.M.F. 1.16	16.38 to 0 P.D. – See curve.
153	7.75 to 30V. E.M.F. 1.13	15.50 to 0. P.D. – See curve
154	4.50 to 30V, E.M.F. .92	8.62 to 0 Av. P.D – See curve
155	6.00 to 30V, E.M.F. .93	10.50 to 0 P.D. – See curve
156	8.39 to 30V, E.M.F. .915	16.54 to 0 P.D. – See curve
157	8.87 to 30V. E.M.F. .98	18.62 to 0. P.D. high .5 A-H
158	14.75 to 30V, E.M.F. .99	18.50 to 0 P.D. high 5½ A-H

12/19/05.

152 Cu from #146 oxidized by current in 2% NaOH – 2 amps for 12 hrs.

153 Cu from 147 oxidized by current in 2% NaOH – .5 amps for 24 hrs.

154 Cu from 145 dipped in fused NaOH 5 min.

155 Cu from 148 dipped in fused NaOH 10 min

156 Cu from 142 in fused NaOH with current – 2.5 amps for 10 min.

157 Cu from 143 allowed to self-heat in air after washing

158 Cu from 144 heated gently while self-heating in air, after washing

The above nos. 157 – 158 all to be assembled with regular Zincs and run each in 200 cc of 20 o/o NaOH.

12/19/05.

159	20.62 to 30V, E.M.F. .965	22.62 to 0 Av.P.D. .46	159 21 o/o KOH + 20 g. Na Silicate
160	20.25 to 30V, E.M.F. .965	22.09 to 0 Av.P.D. .47	160 Same KOH + 25 g. Na Silicate
161	21.50 to 30V, E.M.F. .97	22.46 to 0. Av. P.D. .48	161 Same KOH + 30 g. Na Silicate
162	20.75 to 30V, E.M.F. .96	22.16 to 0. Av. P.D. .51	162 21 o/o KOH + 10 g. K Silicate dry
163	21.90 to 30V, E.M.F. .96	23.46 to 0. Av.P.D. .49	163 Same KOH + 15 g. K Silicate dry
164	25.50 to 30V, E.M.F. .96	27.18 to 0 Av.P.D. .48	164 Same KOH + 20 g. K Silicate dry
165	15.25 to 30V, E.M.F. .96	16.17 to 0 Av.P.D. .46	165 15 o/o Na OH + 20 g. Na Silicate
166	17.37 to 30V, E.M.F. .955	19.84 to 0. Av.P.D. .46	166 Same Na OH + 15 g. K Silicate dry

12/21/05.

167	24.25 to 30V, E.M.F. .965	26.69 to 0. Av.P.D. .49	167 21 g. KOH + 20g. K Silicate dry.
168	22.17 to 30V, E.M.F. .97	29.21 to 0. Av.P.D. .49	168 Same KOH + 25g. K Silicate
169	22.62 to 30V, E.M.F. .975	27.50 to 0 Av.P.D. .48	169 Same KOH + 30g. K Silicate
170	24.00 to 30V, E.M.F. .965	29.25 to .06 V. Av.P.D. .48	170 Same KOH + 35 g. K Silicate
171	20.57 to 30V, E.M.F. .975	22.65 to 0 Av.P.D. .49	171 18 g. KOH + 20 g. K Silicate
172	20.78 to 30V, E.M.F. .101	22.24 to 0. Av.P.D. .49	172 Same KOH + 30g. K Silicate
173	25.75 to 30V. E.M.F. .96	29.25 to 0.11 V. Av.P.D. .49	173 24 g. KOH + 20 g. K Silicate
174	23.00 to 30V, E.M.F. .96	27.67 to 0 Av.P.D. .50	174 Same KOH + 30g. K Silicate

[111]

175	20.75 to .30V, E.M.F. 1.095	24.75 to 0. Av.P.D. .52	Curve O.K.
176	11.14 to .30V, E.M.F. 1.095	24.50 to 0 Av.P.D. .64	
177	11.45 to .30V, E.M.F. 1.00	24.33 to 0 Av.P.D. .55	
178	20.26 to .30V, E.M.F. .985	25.92 to 0. Av.P.D. .52	Starts high
179	6.68 to .30V, E.M.F. .845	25.33 to 0. Av.P.D. .52	

12/21/05.

175 Cu*137 – Rinse in H_2O. Soak in 33 o/o KOH. Self-heat.

176 Cu 158 – Wash and repeat treatment.

177 Cu 159 – Wash + self-heat.

178 Cu 161 – Self-heat just as it comes out of cell.

179 Cu 160 – Assemble with new Zn and in new solution + run.

The above nos. 175 – 179 are to be assembled with new zincs each in 200 cc 33 o/o KOH and run regular.

180	14.25 to .30 V.	
	E.M.F. .965	Av. P.D. 4 A-H high
181	19.91 to .30 V.	
	E.M.F. .985	Av. P.D. 5 A-H high
182	14.17 to .30 V.	
	E.M.F. 1.015	Av. P.D. .56
183	10.75 to .30 V	
	E.M.F. .96	Av. P.D. 3 A-H high-Seems
184	15.17 to .30 V,	18.43 to 0
	E.M.F. 1.00	Av. P.D. .53
185	10.00 to .30 V	
	E.M.F. .965	Av. P.D. .67
186	15.32 to 0	Av. P.D. .30
	See curve	E.M.F. .96
187	9.81 to .30 V.	
	E.M.F. .98	Av. P.D. .58

12/27/05

180 $Cu^{*}163$ taken out and ox quickly rising gentle heat.

181 $Cu^{*}164$ taken out + S-H slowly.

182 $Cu^{*}173$ washed, soaked in hot conc. KOH for few min, then S-H. Would not S-H so washed KOH out

183 $Cu^{*}174$ washed, soaked in conc. KOH cold. Then S-H.

184 $Cu^{*}175$ Repeat treatment

185 $Cu^{*}178$ Repeat treatment

186 $Cu^{*}167$ taken out and dipped directly in hot 33% — then S.H.

187 $Cu^{*}168$ taken out and heated o/s over Bunsen burner.

Runs 180 - 187 each in 200 cc of 33% KOH solution.

188	14.63 to .30 V, E.M.F. .945	14.71 to 0. Av. P.D. .53	188 200 cc. 21 o/o KOH + 20 g of Ja Hydrofluorosilicate
189	15.50 to .30 V, E.M.F. .95	17.57 to 0 Av. P.D. .50	189 200 cc. 20 o/o JaOH + 20 g of Ja Hydrofluorosilicate
190	35.31 to .30 V. E.M.F. .975	Av. P.D. .52	190 21 o/o KOH. + 30 g. K Silicate using type J ground 1½ CuO.
191	17.64 to .30 V, E.M.F. .96	19.54 to 0 Av. P.D. .49	191 200 cc 25 o/o JaOH.
192	9.31 to .30 V, E.M.F. .95	9.69 to 0. Av. P.D. .52	192 Reg. 21 o/o KOH, 200 cc. Run cold (About 12°C av.)
193	18.75 to .30 E.M.F. .96	22.04 to 0 Av. P.D. .51	193 33 o/o KOH — Run cold (About 12°C. av.)
194	12.00 to .30 E.M.F. .95	13.95 to 0 Av. P.D. .45	194 20 o/o JaOH — Run cold (About 12°C. av.)
195	E.M.F. .96 See curve.	8.5 A-H to 0	195 25 o/o JaOH — Run cold (About 12°C av.)
196	18.56 to .30 V, E.M.F. .96	20.15 to 0. Av. P.D. .49	196 21 o/o KOH + 20 g K Silicate Run cold (About 12°C av.)

12/27/05.

197 16.86 to 30V, 18.43 to 0
E.M.F. .96 Av.P.D. .49

198 11.00 to 30V, 14.38 to 0
E.M.F. .96 Av.P.D. .41

199 11.75 to 30V.
E.M.F. .96 Av.P.D. .62

200 6.70 to 30V.
E.M.F. .96 Av.P.D. .70

201 12.00 to 30V.
E.M.F. .975 Av.P.D. .62

202 12.81 to 30V.
E.M.F. .95 Av.P.D. .55 - 3.5 A-H high

203 12.12 to 30V.
E.M.F. .97 Av.P.D. .53 - 3 A-H high

204 12.25 to 30V.
E.M.F. .96 Av.P.D. .52 - 1.5 A-H high

205 12.50 to 30V.
E.M.F. .96 Av.P.D. .60 - 6.5 A-H high

Run 197 — 200 — ~33% KOH

197 21% KOH + 20g Na Silicate
Run cold (About 12°C av.)

198 20% NaOH + 10g Na Silicate
Run cold (About 12°C av.)

1/3/06

199 Cu* 181 Repeat treatment

200 Cu* 184 Repeat treatment

201 Cu* 185 Repeat treatment

202 Cu* 193 S-H neg.

203 Cu* 190 S-H neg.

204 Cu* 191 S-H neg.

205 Cu* 195 H_2O_2 + KOH

1/3/06

206 15.85 to 30 V. (4 A-H) 8 hrs. cold (0°C.)

207 26.69 to 30 V. 15 A-H cold (-8 to +8°)
Drop of 7° in temp caused drop of .08 volts

208 25.69 to 30 V. 14 A-H cold (-8 to +8°)
7° drop = .12 volts drop. Smoked some
After discharg. white dep. ++

209 26.13 to 30 V. 14 A-H cold
7° drop = .12 volts drop.

210 19.00 to 30 V. 7 A-H cold
7° drop = drop to 0

211 19.96 to 30 V. 8 A-H cold

After discharg. white dep. ++++ Smoked on top

212 23.00 A-H to 30 V. 11 A-H cold
7° drop = .12 volts drop.
After discharg. white dep. +++

213 22.12 to 30 V. 10.5 A-H cold
7° drop = .18 volts drop
After discharg. white dep. ++

214 25.62 to 30 V. 14 A-H cold
7° drop = .06 volts drop.
After discharg. white dep. +

206 20 o/o NaOH neg. Runs cold

207 33 o/o KOH neg. Runs cold

208 21 o/o KOH + 20 g. KS silicate Runs cold

209 Same KOH + 40 g. KS silicate Runs cold

210 Same KOH + 60 g. KS silicate Runs cold H2O caused white dep.

211 Same KOH + 15 g. Na Silicate Runs cold (Na Silico Merelis crystals now.)

212 Same KOH + 30 g. Na Silicate Runs cold

213 Same KOH + 45 g. Na Silicate Runs cold - H2O caused white dep.

214 24 o/o KOH + 10 g. KS silicate Runs cold

215 27.00 to 30V. 15 A-H cold
7° drop = .06 volts drop

215 24 o/o KOH + 20 g K Silicate
Run cold

I like above nos. 206 – 215 all to have I zincs and special heavy B oxides (made 1½ length)
Na Silicate now used as Myerle's crystals.

216 10.91 to 30V. 11.03 to 0
E.M.F. .955 Av.P.D. .55

216 21 o/o KOH + 20 g K Silicofluoride

217

218 E.M.F. 1.10 Dropped to 0 when first put on discharg – then came up normal Av.V. .50 which is lower than reg. ox.

218 New Oxide soaked in $CuSO_4$ sol. then KOH to ppt. $Cu(OH)_2$ in pores. Type B 33 o/o KOH

219 12.44 to 30V, 13.96 to 0.
E.M.F. .95 Av.P.D. .49

219 90 cc of Solution mixed for Boodle method was 24 o/o KOH containing 30 g Na Sil. to 200 cc.

1/5/06.

J. Electrodes (noted at 50 amp-hrs. will now be used, except when otherwise noted, = in 200 cc of electrolyte.

Discharg. rate now – 1 ampere.

220 14.98 to 30V, 15.30 to 0.
E.M.F. .92 Av.P.D. .50

220 20 g% NaOH reg.

221 26.00 to 30V, 28.43 to 0.
E.M.F. .97 Av.P.D. .49
White dep. after discharg. about 1/16"

221 21 g% KOH + 20 g. K Silicate

222 30.23 to 30V,
E.M.F. .99 Av.P.D. .48

222 Same KOH + 30 g. K Silicate

223 30.00 to 30V, 32.50 to 0.
E.M.F. .985 Av.P.D. .49

223 Same KOH + 40 g. K Silicate

224 22.80 to 30V, 23.56 to 0
E.M.F. .995 Av.P.D. .48

224 Same KOH + 50 g. K Silicate

225 19.83 to 30V, 18.26 to 0
E.M.F. .995 Av.P.D. .49

225 Same KOH + 60 g. K Silicate

226 10.00 to 30V, See curve.
E.M.F. 1.00 Av.P.D. .46
Discharg. cont @ .5 amp. after coming to
@ 1 amp = now 19.25 total.

226 Same KOH + 70 g. K Silicate

227 E.M.F. 1.00 Came to 0 in 15 min. @ 1 amp. Cont. discharg @ .5 amps and it ran 12.10 A-H at this rate.

228 24.00 A-H to .30V, 24.83 to 0.
E.M.F. .95 Av. P.D. .48
White dep. after discharg about $\frac{1}{4}$"

229 26.23 to .30V, 28.25 to 0.
E.M.F. .985 Av. P.D. .48
White dep. after discharg about $\frac{1}{16}$"

230 26.00 to .30V, 27.50 to 0.
E.M.F. .935 Av. P.D. .47
White dep. after discharg - little

231 27.00 to .30V, 29.50 to 0.
E.M.F. .93 Av. P.D. .46

227 Same KOH + 80 g. K Silicate

228 Same KOH + 20 g. Na Silicate
2 + 0. dry crystals.

229 Same KOH + 30 g. Na Silicate

230 Same KOH + 40 g. Na Silicate

231 Same KOH + 20 g K + 20 g Na Sil

233 15.42 to 30 V.
E.M.F. .96 Av.P.D. .54

234 1.44 to 30 V.
P.D. high

235 2.95 to 30 V.
P.D. ± high

236 1.35 to 30 V.
P.D. high polarity

1/10/06.

Try reoxidizing exhausted Cu oxides with the following oxidizing agents —

Use B oxides and discharge in 200 cc. 33 % KOH @ 500 m-a.

232 Na Hypochlorite

233 Ca Hypochlorite
Cu* 196

234 Ca Hypochlorite (Bleaching powder in water.)
Cu* 169

235 K Permanganate
Cu* 170

236 K Ferricyanide
Cu* 171

237 Na Plumbate

238 K Ferrite

239 8.62 to .30 V
E.M.F. .98 P.D high I.A-H

240 13.06 to .30 V.
E.M.F. .965 Av.P.D. .55 - .5 A-H high

241 23.17 to .30 V, 24.75 to 0
E.M.F. .965 Av.P.D. .53 reg.

239 H_2O_2 in water
Cu* 172

240 H_2O_2 in KOH.
Cu* 197

241 This one to be a new Cu oxide treated with H_2O_2 in water.

242

243

244

245

246

247	28.33 to 30V.	30.75 to 0.	247 21 o/o KOH + 25 g K Silicate of Timer + Amerods. 5 Electrodes reqd.
	E.M.F. .985	Av. P.D. .47	
	Sol. pinks after stand, * See note in book.		
248	29.56 to 30V.	32.13 to 0	248 Same KOH + 30 g. K Silicate
	E.M.F. .99	Av. P.D. .46	
	Sol. milds after stand.		
249	32.40 to 30V.	34.47 to 0	249 Same KOH + 35 g. K Silicate
	E.M.F. 1.01	Av. P.D. .47	
	Sol. green-yellow after stand.		
250	17.30 to 30V.	17.75 to 0.	250 27 o/o KOH
	E.M.F. .965	Av. P.D. .55	
251	28.97 to 30V.	29.47 to 0.	251 Same KOH + 10 g. K Silicate
	E.M.F. .97	Av. P.D. .51	
	Sol. pinks slightly after stand.		
252	30.00 to 30V	30.63 to 0	252 Same KOH + 20 g. K Silicate
	E.M.F. .97	Av. P.D. .51	
	Sol. pinks very little after stand.		
253	23.30 to 30V.	23.77 to 0	253 33 o/o KOH
	E.M.F. 97.5	Av. P.D. .55	
254	31.63 to 30V.	32.31 to 0	254 Same KOH + 10 g. K Silicate
	E.M.F. .98	Av. P.D. .505	
255	31.21 to 30V	31.73 to 0	255 Same KOH + 20 g. K Silicate
	E.M.F. .98	Av. P.D. .505	

256	25.21 to 30V.	25.80 to 0	256 24 o/o KOH + 20 g. Na Silicate of
	E.M.F. .98	Av.P.D. .51	Marchis. (Pure crystl.)
257	26.78 to 30V.	27.67 to 0	257 Same KOH + 30 g. Na Silicate
	E.M.F. .98	Av.P.D. .51	
258	28.73 to 30V.	29.33 to 0	258 Same KOH + 40 g. Na Silicate
	E.M.F. .99	Av.P.D. .49	
259	27.28 to 30V	27.98 to 0	259 27 o/o KOH + 20 g. Na Silicate
	E.M.F. .98	Av.P.D. .50	
260	29.75 to 30V.		260 Same KOH + 30 g. Na Silicate
	E.M.F. .98	Av.P.D. .49	
261	29.00 to 30V.	30.16 to 0	261 Same KOH + 40 g. Na Silicate
	E.M.F. .985	Av.P.D. .48	
262	30.00 to 30V.		262 30 o/o KOH + 20 g. Na Silicate
	E.M.F. .98	Av.P.D. .50	
263	31.25 to 30V.		263 Same KOH + 30 g. Na Silicate
	E.M.F. .98	Av.P.D. .50	
264	29.81 to 30V.	30.41 to 0	264 Same KOH + 40 g. Na Silicate
	E.M.F. .985	Av.P.D. .50	

*See note in Book

1/25/06.

$Cu(OH)_2$ made by Queneby, in reg. storage battery cups.

265 Smelled from .089" to .124" = .035"
2.6 hrs. high V. – 3 hrs. norm. – 3.3 hrs. polarized
V curve
266 3.3 hrs. high – 9.5 hrs. norm. –

*265 Plain 4g cake, 21% KOH. Bog. Discharge @ 100 mil-amps. Pressure 75 at S.P. – 100 con.
266 Plain 4g cake. 10% KOH.

267 1.3 hrs. high – 11.5 hrs. norm –
13.75 on-a-h to .30V. highest one.

267 Plain 4g cake. 33% KOH.

268 15 min. extra high volts – 1.25
5 hrs. high – 1 hr. norm. – 7 hrs. pol.

268 8+2 mix with graphite.
4g cake. 21% KOH.

269 25 min. extra high volts – 1.20
3 hrs. high – 1 hr. norm. – 5 hrs. pol.

269 7+3 mix with graphite.
4g cake. 21% KOH.

270 5 hrs. norm. – 14 hrs. pol.

270 Plain 3.5 g cake. 21% KOH
Queneby #2 batch.
2/2/06.

271 1.455 A-H to .30V. Good reg. curve
E.M.F. 1.08 Av. P.D. .55 V.

271 Plain 4g. 40 at. S.P. + Con.
21% KOH

272 4 hrs. pol – 15 hrs. norm.
E.M.F. 1.46.

272 Plain 4g. 200 at. S.P. + Con.
21% KOH.

273 10 hrs. at .80 volts, 4 hrs. norm.
E.M.F. 1.65

274 10.5 hrs. at .78 volts, 3 hrs. norm
E.M.F. 1.54

275 Ran at 0 -.04 V. for 3 hrs. then reversed.
E.M.F. 1.11

276 4 hrs high - 3 norm. - 3.5 pick.
E.M.F. 1.62

277 7.5 hrs high - 3 norm.
E.M.F. 1.38

278 2.5 hrs. high - 8 norm.
E.M.F. 1.12

280 4 hrs. high - 14.5 norm.
E.M.F. 1.18.

281 20.56 A-H to .30 V. Reg. curve
E.M.F. 1.00 Av. E.F. .62

273 8+2 mix with graphite. 4 g cake
50 at. S.P. + Corr. 21% KOH

274 8+2 mix with ½ flake. 4 g cake
50 at. S.P. + Corr. 21% KOH

275 Plain 4 g. 50 at S.P. + Corr.
Alcoholic solution KOH

276 7+3 mix with graphite, moistened
with water. 50 at S.P. + Corr. 4 g cake
21% KOH.

277 Same as 276 but moisten mix
with KOH.

278 Same as 277 then put pockets
in KOH + bring up nearly to boil

279 Same as 277 in copper plated
pockets

280 Half + half mix with black
oxide. 50 at. 4 g cake. 21% KOH.

281 Black oxide mixed 8+2 with
graphite dry. 75 at. 4 g cake. 21% KOH

1/19/06.

Special Dry Cells.

282 Opened top of new "Ever-Ready" cell and soaked in H_2O for about 50 hrs. to get out the NH_4Cl. Then dried + poured in 21% KOH + Sil.

283 Took the black mixture out of a dry cell and washed it thoroughly. Also washed cell + blotting paper. Then when mix was dry, packed it back in cell + put in 120 cc. 21% KOH + Sil.

284 Used Zn case from new "Mexico" cell. BOxide. Absorber - HgO. Solution 24% KOH + 30 g Sil to 200 cc. Took 320 cc. of solution.

285 Zn case from new "Star" cell. BOxide. Absorber charcoal. Solution 24% KOH + 30 g Sil to 200 cc. Took 200 cc solution.

286 7.00 A-H to 0, cold + 9.93 normal =
16.93 A-H. total. Av. P.D. cold = .42 V.

287 19.83 A-H to 0, cold + 3.75 normal =
23.58 A-H total. Av. P.D. cold = .42 V.

288 15.61 A-H to 0, cold + 13.31 normal =
28.92 A-H total. Av. P.D. cold = .41 V.

289 25.21 A-H to 0, cold + 4.10 normal =
29.31 A-H total. Av. P.D. cold = .38 V.

290 17.23 A-H to 0, cold + 7.51 normal =
24.74 A-H total. Av. P.D. cold = .42 V.

291 18.41 A-H to 0, cold + 7.06 normal =
25.47 A-H total Av. P.D. cold = .38 V.

292 17.78 A-H to 0, cold + 6.98 normal =
24.76 A-H total. Av. P.D. cold = .41 V.

293 24.63 A-H to 0, cold + 1.13 normal =
25.76 A-H total. Av. P.D. cold = .39 V.

294 20.61 A-H to 0, cold + 6.40 normal =
27.01 A-H total Av. P.D. cold = .37 V.

2/3/06

286 20 % Na_2OH (200 cc). J Electrodes

287 33 % KOH

288 21 % KOH + 30 g K Sil.

289 27 % KOH + 20 g K Sil.

290 24 % KOH + 20 g Na_2 Sil.

291 Same KOH + 30 g Na_2 Sil.

292 Same KOH + 40 g Na_2 Sil.

293 27 % KOH + 20 g Na_2 Sil.

294 Same KOH + 30 g Na_2 Sil.

295 23.83 A-H to 0, cold + 1.43 normal =
25.26 A-H. total. Av. P.D. cold = .39 V.

296 22.68 A-H to 0, cold + .86 normal =
23.54 A-H total Av. P.D. cold = .40 V.

297 22.75 A-H to 0, cold + .56 normal =
23.31 A-H total Av. P.D. cold = .39 V.

298 22.60 A-H to 0. cold + 1.50 normal =
24.10 A-H total. Av. P.D. cold = .36 V.

295 Same KOH + 40 g. Na_2Si.

296 30 % KOH + 20 g. Na_2Si.

297 Same KOH + 30 g. Na_2Si.

298 Same KOH + 40 g. Na_2Si.

The above numbers 286 - 298 are to be run cold at 1 amp. until they all reach 0. Then bring them in room and when they have gotten up to ordinary room temperature, continue discharge at same rate.

Na_2Si electrolyte used was wet (determination) except in 291 + 293. (Tyrrells).

Cold temperature averaged about 1°C. (−3 to +10° variation).

E.M.F. 88 4.9 A-H to 0. Av. P.D. .71

299 Sol. blue at top – Cu is soluble + is ppt. by Zn. White crystals also form on Zn which are not very sol. in H_2O.

300 Same as 299.
E.M.F. 84 7.42 A-H to 0 Av. P.D. .74

301 Sol. reacts with NH_4Cl; Cu sol.
E.M.F. 94 – Reached .20 V in ½ hr. and 0 in 4 hours

302 68.435 g. – 46 = 22.435 g. used
19.43 A-H to 0 = .866 A-H per g.
= 1.154 g. per A-H.

303 65.80 g. – 52.18 = 13.62 g. used
11.28 A-H total = .828 A-H per g.
= 1.207 g. per A-H.

304 69.94 g. – 44.08 = 23.86 g. used
20 A-H total = .838 A-H per g.
= 1.193 g. per A-H.

305 50.72 g.

306 50.11 g.

307 49.65 g.

Zn should run in 2 hours
remark to be made
cells run 33 %
KOH. Possible
540 m-A-H used
2 e.o.f. in original
Zn higher

2/20/06.

299 200 cc 15 o/o NH_4Cl in type B Salamde. Discharge @ 500 ma

300 200 cc 25 o/o NH_4Cl in type B Salamde.

301 200 cc 15 o/o NH_4Cl + 20 g Na_2SiO_3 B Salamde

302 Weigh B Zinc carefully – Then run in 200 cc 20 o/o NaOH to 30 V. + weigh again

303 The same in 21 o/o KOH.

304 The same in 33 o/o KOH.

305 Weigh B. Oxide carefully – Then run in excess of 20 o/o NaOH + Zn till curve shows oxide reduced

306 Same in 21 o/o KOH

307 Same in 33 o/o KOH

Results.

308

309

310

311

308 Make CuO pocket and assemble on negative side with 2 Zn's on positive. Chg. 1 min @ 100 m-a in 21% KOH. CuO 6 g.

309 Make Fe - CuO cell, - CuO on positive side. Chg. Fe against strip. Run @ 100 m-a. 21% KOH. CuO 6 g.

310 Make Zn - ZnO_2 cell, - Chg. Zn against Zn. Run @ 100 m-a. 21% KOH.

311. Make Al - ZnO_2 cell. Chg. Zn then put Al in and run @ 100 m-a. 21% KOH.

Made 2 cells for each number.

3/1/06.

For Sealing Cell.

Mix substances in given proportions, cast into cakes and test mechanically, and chemically for solubility. Also test for adhesion to zinc.

312	10 o/o Paraffine	
	90 o/o Asphalt (Hard Mexican)	
313	20 o/o Paraffine	
	80 o/o Asphalt	"
314	30 o/o Paraffine	
	70 o/o Asphalt	"
315	40 o/o Paraffine	
	60 o/o Asphalt	"

Substances alone –

Paraffine

Hard Mexican Asphalt

10 o/o Paraffine good. Not porous. Still brittle but not so much as asphalt alone. Paraffine prevents the formation of bubbles.

As per cent of ~~asphalt~~ paraffine increases brittleness decreases and cakes get tough but soft. 314 + 315 are even somewhat elastic.

None of these stick to zinc well.

3/2/06.

316 Pretty good; pliable; tough
Sticks to zinc well.
Soluble — Soaked in 33% KOH
one week + solution was slightly
yellow.

317 Pliable and tough but
rather soft.
Soluble — Same as #316.

318 Too soft

Substances —
Paraffine
Soft Mexican Asphalt

316 5% Paraffine
95% Asphalt

317 10% Paraffine
90% Asphalt

318 20% Paraffine
80% Asphalt

3/2/06.

Substances

Different kinds of Asphalt alone, for comparison with mixes.

319 Not strong; very brittle — About like "Prime Cuban."
In 33⅓ KOH. one week — sol. colorless.

319 Hard Mexican

320 Soft, sticky, somewhat elastic. Rather stronger than hard Mex. Sticks to zinc very well.
In 33⅓ one week — sol. dark brown-yellow

320 Soft Mexican

321 Strong, hard, + somewhat porous. Dull appearance. Does not stick to zinc well.
In 33⅓ one week — sol. very light color.

321 Hard Cuban

322 Hard but not strong. Very brittle. Very shiny appearance. Does not stick to zinc well.
In 33⅓ one week — sol. colorless.

322 Prime Cuban

323. Very strong + hard. Dull appearance. Does not stick to zinc well. Difficult to fuse.
In 33⅓ one week — sol. dark brown-yellow

323 Crude Trinidad

3/2/06.

Substances
Paraffine
Hard Cuban Asphalt

About same as Crude Trinidad.

324 10 o/o Paraffine
90 o/o Asphalt

325 20 o/o Paraffine
80 o/o Asphalt

326 30 o/o Paraffine
70 o/o Asphalt

About same as Hard Mexican

317/06

Substances
Paraffine
Prime Cuban Asphalt

327 10 o/o Paraffine
90 o/o Asphalt

328 20 o/o Paraffine
80 o/o Asphalt

329 30 o/o Paraffine
70 o/o Asphalt

3/2/06.

Substances
Paraffine
Crude Trinidad Asphalt

330 Good – very strong and hard. Sticks to spruce pretty well.
In 33% one week – very slight color

330 10% Paraffine
90% Asphalt

331 Good – strong; slightly pliable. Sticks pretty well.
In 33% one week – very slight color.

331 20% Paraffine
80% Asphalt

332 Not so good.

332 30% Paraffine
70% Asphalt

3/5/06.

Mix small amounts of the following substances with "Hard Mexican" or "Prime Cuban" Asphalt and note the effect upon properties of the mixture.

333 Coal Tar

334 Coal Tar Pitch (?)

335 Wood Tar Pitch

336 Rosin

337 Sulphur

338 Naphthaline

339 Cylinder Oil

333 Somewhat pliable but not very strong.

334 M.P. - Melting point too high

335 Not very strong; brittle

336 Very brittle and not strong

337 M.P. - Forms bubbles and blows mixture up to a froth

338 Brittle; not strong

339 Brittle; not very strong

340 Good; not so brittle; somewhat porous but quite strong. Sticks to fgr O.K.	340 Caoutchouc
341 No improvement unless much as used (say 50%). This makes it strong but still brittle.	341 Gelutong
342 Quite strong, very hard, brittle	342 Magnesia
343 Fairly strong; better than asphalt alone	343 Infusorial Earth
344 Fairly strong	344 Sand
345 N.G. – Mixture very hard to fuse and very brittle.	345 Water Glass

3/8/06.

Melt up the following mixtures, cast into cakes and note properties of these after cooling. Try different proportions.

346. Good. 10 o/o Paraffine enough. Strong, hard, slightly pliable, sticks to fingernail. Melts easily.

346 Crude Trinidad Asphalt, and Paraffine.

347 Hard, still brittle, quite strong. Small quantities of Caoutchouc cause very little improvement.

347 Crude Trinidad Asphalt and Caoutchouc.

348 Hard, still brittle, fairly strong. About like 347.

348 Crude Trinidad Asphalt and Gilsonite.

349 Soft, very pliable, tough.

349 Crude Trinidad Asphalt, Paraffine and Gilsonite

350 Rather soft, pliable, fairly strong

350 Crude Trinidad Asphalt, Paraffine and Caoutchouc.

351 Very good. Little stronger even than 346, hard, slightly pliable, sticks to fingernail.

This applies to a mixture as follows:— Asphalt 70 o/o, Sand 20 o/o, Paraffine 10 o/o.

351 Crude Trinidad Asphalt, Paraffine and Sand (fine).

3/14/06.

Oxides for Dry Cell.

Dry making oxides wipe with a copper strip in the middle to strengthen and support them as well as to use for the electrical connection.

1

352 Makes wipe O.K. Quite strong after baking.

352 Moisten oxide with 33 o/o KOH. Give 300 at press (≅ 5.12 tons per in²) Dry with gentle heat and then bake.

353 Better than 352. Oxide seems to be fused to strip. Presents mitrified surface when broken away – probably fused Cu_2O.

353 Moisten with 21 o/o KOH.

354 Makes wipe good but crumbles and cracks during baking. O xes on top of heap better than others.

354 Moisten with 25 o/o Na OH.

355 Not quite as strong as 352 after baking. Impracticable to handle as it is very weak until baked.

355 Moisten with H_2O.

[69]

3/19/06.

356 Results.

Made a small measure of 64 cc capacity. When this is filled level full of moistened oxide it makes a cake $\frac{3}{4}$" wide which is about right for 50 amp-hrs. (weight approximately 100 g.)

In mixing, 10 cc of KOH solution to each one of these measures of dry oxide is just right.

Best pressure to use seems to be 225 at. = 4.29 tons per in.^{2} of oxide. Heavier pressure works good also but is unnecessary.

The drying is done over a steam radiator. If left there over night they are dried sufficiently.

In baking, the temperature must be brought up very slowly. Have been putting cakes in at 8.00 A.M. and burning gas low without air until 1.00 P.M. Then start blower and slowly increase heat until at about 3.30 P.M. oxides are up to a bright red heat. Keep

356 Make lot of oxides up, using 21 o/o KOH to moisten and determine right amount of moisture also best pressure to use and details of the drying & baking.

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firing at this temperature for about 2 hours, then turn gas out and let cool slowly.

When cold the oxides are boiled out with water and the surface is reduced by zinc dust moistened with KOH. They are then boiled out again and dried.

3/20/06.

To Amalgamate the Zinc.

357 Works fairly well but deposit of Hg is too thick.

357 Clean with dil. H_2SO_4, then pour in metallic mercury and shake it around until it adheres.

358 Works pretty good but deposite of Hg is not always clean. Can be brightened up by washing with dil. HNO_3.

358 Method given by Carhart in his "Primary Batteries" as follows, — Dissolve 1 part Hg by weight in 3 parts aqua regia, then add 3 parts more HCl. Immerse Zinc in this solution.

359 HCl throws down white ppt., probably calomel, from Hg Nitrate, which will not dissolve unless much more HCl is added. When this is done solution does not work well. Hg is precipitated but has brown coating.

359 Method given by Carle Benjamin in his "The Voltaic Cell" as follows, — To concentrated solution of Mercuric Nitrate add its volume of HCl. Immerse Zinc in this solution.

360 Results.

If zinc is fairly clean a mixture of 1 vol. Nitrate solution, 2 vols. HNO_3, and 9 vols. H_2O gives a bright, uniform deposit of Hg.

If zinc is not so clean, 1 vol. Nitrate solution to 3 of HNO_3 and 8 of H_2O should be used.

After amalgamating, the cans should be rinsed and then filled with strong KOH and allowed to stand for an hour or so. This will clean and brighten the mercury deposit and will also allow the local action, which there is likely to be at first, to take place before the cell is sealed up.

360 Make conc. solution of Hg Nitrates by dissolving Hg in HNO_3. Then to 1 part of this solution add "x" parts of HNO_3 to clean deposit and "y" parts of H_2O to retard action.

I should think a mixture of this kind with the proportions determined right would work O.K.

Results.

361 KOH bubbled up through sealer and when it cooled off passages remained, down to liquid. Sealer was poured too hot and air gaps between electrolyte and cover was not large enough.

Short-circuited cell over night and coin was eaten right through, mostly at the top.

3/22/06.

Dry Cells.

361 Thin coin, soldered; not amalgamated but cleaned with H_2SO_4.

Oxide looks poor — calcined with 21 o/o KOH.

Electrolyte, 33 o/o KOH, about 310 cc.

Cover, cardboard, not dipped.

Sealer #346, 10 o/o Paraffine.

Results.

367 Seals between sealer and can.

Short-circuited over night and can was eaten right through in a circle on plane with top of oxide. This shows a defect of this kind of oxides which must be remedied. Exposing the copper strip at base of oxide as well at the top will help some. It may be O.K. however if surface is reduced good. This oxide was not.

Dry Cells, cont'd.

367 Thin can amalgamated by "357.

Oxide made with 7 1/2%.

Electrolyte, 33% KOH just in hot.

Cover, cardboard dipped with reg. sealer "346.

Sealer, regular "346, poured in three instalments so as not to heat up cell so much.

Results.

363 Looks O.K. but when held upside down, a small pinhole shows up between sealer and can. Sealer tends to shrink away from can on cooling which probably causes these.

S.C. over night and can was eaten through in a clearly defined circle; cutting the top part loose.

Dry Cells, contd.

363 Tin can, amalgamated by #358.

Oxide poor, 21%.

Electrolyte, 33% KOH put in cold, 305 cc.

Cover, cardboard doped with neg. sealer.

Sealer, neg. #346 poured all at once and quite hot.

Air-gap about ¼".

Results

364 Very small pinholes between sealer and can, show up on inverting cell.

On standing several days the KOH crept and the pinholes grew larger until cell leaked almost all the way around at the top. Small leaks made their appearance through the solder of the seams also.

Dry Cells, cont'd.

364 Thin can, amalgamated by #358.

Oxide poor, 21%.

Electrolyte, 3-3 o/o KOH put in warm.

Cover, cardboard dipped with reg. sealer.

Sealer, reg. #346 poured quite hot and all at once.

Air gaps large about ⅜" or more.

3/27/06.

Dry Cells, contd.

365 Thick can, anod. #360.
Oxide poor
Electrolyte, 33% KOH, 315 cc.
Cover, cardboard dipped neg. Concrete
Sealer #346 poured all at once and very hot.
Air-gap about 1/4".

Results.

365 Seales only between sealer and can at seam.

Stood 2 days and then discharged at 1 amp.

Ran 49.5 amp.-hrs to 30 V. with average P.D. of .55 V.

Opened cell after discharge and found electrolyte milky and blueish. The can which origin-ally was .040" thick was now .018" at the top and .026" at the bottom. The oxide was all reduced except a very little at the bottom. The can that was left was somewhat brittle and could be broken easily, indicating that rather too much mercury was used.

Results.

366. Seals very slightly between sealer and can at seam.

Sealer was poured too hot and shrunk great deal. Not enough rubber to fill in cracks well.

Short-circuited cell and in the first hour it heated up so that plug of sealer was loosened and forced up a little. After leaving S.C. on for 24 hrs., opened cell to examine.

KOH looked milky + seemed to be effervescing. Zinc was coated with a bluish spongy scale. Zinc seemed to be eaten away fairly uniformly and not very deep. Oxide was reduced right in to strip at top but only about $\frac{1}{16}$" in at bottom.

Dry Cells, cont'd.

366. Thick can, annul. "360. Oxide poor. Electrolyte, 33 o/o KOH, 313 cc. Cover, cardboard dished reg. concave side up reg. Sealer, about $\frac{1}{16}$" melted rubber and then "346 poured all at once and very hot.

Results.

367 O.K. - does not leak!
Stood over night and slight leak appeared between sealer and can at seam.
After standing 1 day, discharged at 1 ampere.
Ran 48.49 amp-hrs to 30 V. with average P.D. of .55 V.

Dry Cells, cont'd.

367 Thick can, anual # 360.
Oxide poor
Electrolyte 33% KOH, 310 cc.
Cover, cardboard doped neg.
Sealer # 346. Poured all at once after first cleaning can with emery cloth and benzole. Also smeared seam with sealer down for about 2" inside.

Results.

368 After standing, all might only leaks through pinhole in solder. Does not leak where KOH bubbled up through sealer.

After standing 1 day, discharged at 1 ampere.

Ran 43.2 amp-hrs to 30 V. with average P.D. of .56 V.

Dry Cells cont'd.

368 Thick can anneal. #360. Solder in top of seam inside and can cleaned inside at top with emery cloth + benzole.

Oxide O.K. – reduced good.

Electrolyte, 33 0/0 KOH, 310 c.c.

Cover, cardboard dipped neg.

Sealer, #346 in 2 instalments, 2nd one was spooned very hot and KOH bubbled up through the center of it.

Air-gap small.

Rubber spacing washer.

Results.

369. No leak at first, stood over night then leaked in several places.

After standing one day, discharged at 1 ampere.

Ran 52.95 amp-hrs to 30V. with average P.D. of .55 V.

After discharge, can was still strong and not brittle like #365. It was eaten away very uniformly there being .020" left unattacked at the top and .025" at the bottom. Oxide was all reduced except a little, next to the strip at the bottom and extending up to the middle. Electrolyte was milky as usual.

200 cc of 33⅓% KOH ordinarily gives 24 amp-hrs. or less, therefore 315 cc should give 37.8 amp-hrs. at the most. But 315 cc here in the dry cell runs 52 amp-hrs. or 37½% better than under ordinary conditions. This result must be effected by the conditions in the dry cell which

Dry Cells, cont'd.

369. Thick can, unused. #360. Solder in top of seam and can cleaned at top with emery then benzole.

Oxide good. Strip exposed at bottom as well as top by bending it over in a goose-neck at the bottom and sealing only the lower half to the bend in asphalt.

Electrolyte 33⅓% KOH, 315 cc.

Cover, cardboard dipped wax.

Sealer #346 poured very hot in 2 installments, then when cool more on top to fill up cavity.

Rubber spacing washer.

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are very nearly ideal. The zinc has a very large surface for the electrolyte to act upon and the total amount of electrolyte is located between the two electrodes.

Results.

370 Does not leak.

Stood over night and then small leaks showed up between can + sealer on inverting.

After standing one day discharged at 1 ampere.

Ran 48.15 amp-hrs to 30V. with average P.D. of .55 V.

Solution just came through can near the bottom after running 43 amp-hrs. At the end of discharge it had come through the top also all the way around and can was thin as paper in the middle. Did not come through the bottom apart enough for much to leak out. Oxide was reduced in to strip at top and nearly in at middle and bottom.

Dry Cells, cont'd.

370 Thin can, anneal "360 Solder in top of seam + can cleaned at top with emery cloth and benzole.

Oxide good. Strip exposed at bottom like "369.

Electrolyte, 33 1/3% KOH, 300 cc.

Cover, cardboard dipped neg.

Sealer "346. Some poured first as deep as possible without closing up slit in center alongside the strip, then when expanded air has escaped, finish pouring. This method should prevent bubbling.

Air-gap large.

Copper spacing washer.

Results.

371. Does not leak.
After standing 4 hours, discharged at 1 ampere. Did not start to leak until it had been discharging 18 hours.
Ran 54.8 amp-hrs to 1.0 V. with average P.D. of .54 V.
Zinc was eaten away very uniformly, there being .018" left at the top .022" at the bottom and .023" in the middle. Oxide was completely reduced.

3/29/06.

Dry Cells, cont'd.

371. Tinlok can, anod. #360 Solder in top of seam and can cleaned inside at top with emery cloth.
Oxide good. Strip exposed at bottom like #369. One corner clipped off in bending strip.
Electrolyte, 33% KOH, 315 cc
Does not quite come to top of oxide.
Cover cardboard doped neg.
Sealer #346. Mix 2 materials like #370. Top of can heated with Bunsen burner before and after pouring.
Air-gap about 3/16"
Rubber spacing washer.

Notes.

*247 - This cell stood several days after discharge with the rest and solution became pink. This gradually settled and formed in five distinct layers graduated from the regular straw color at the top, through pink to a pinkish purple at the bottom. The bulk of the solution was straw colored - the four bottom layers occupying about 1½ inch.

*256-264. Silicate dissolved in strong KOH makes clear solution In weaker KOH, solution is turbid.